CLEMSON

IMPACTS

Searching for the solution to kudzu bugs

CLEMSON UNIVERSITY PUBLIC SERVICE & AGRICULTURE - SPRING 2013

Field Days show the way
Forage-fed bulls pass test
Defending against the ash borer
Building an “Intelligent River”

Vice President's Message

We mark milestones as the years go by: anniversaries, birthdays, commemorations of all kinds. In 2012, we reached the sesquicentennial of an event you may have forgotten.

The Morrill Act – which led to the creation of universities like Clemson – was signed into law by Abraham Lincoln. Its framers, offering a land grant to each state, envisioned a network of American colleges that would bring education in agriculture and industry directly to the people who could put that knowledge to work.

Today, 150 years later, those statesmen would be proud.

This issue of Impacts reflects the breadth of Clemson's educational outreach in agriculture and environmental sciences, from research on the frontiers of science to the tried-and-true methods of instruction that have been helping farmers and agribusinesses maximize production and profit for generations.

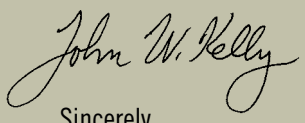
You'll see that from the very first story, as entomologist Jeremy Greene leads the charge to fight the kudzu bug, a new pest of soybeans that emerged three years ago. This fall he brought the nation's leading experts on the insect to Clemson's Edisto Research and Education Center – elbow-to-elbow with the South Carolina farmers who are on the front lines – to determine the most effective and cost-efficient ways to control the bug.

Face-to-face delivery of up-to-date information directly from research scientists has been the hallmark of land-grant universities since the Morrill Act was passed. With field days and workshops in every county in the state, Clemson continues to deliver the latest in research-based information directly to the people who can use it. In this issue we highlight a few: cotton and soybeans, peanuts and corn, watermelons and vegetables, and the burgeoning turfgrass industry. We also review the Advanced Plant Technology Program at Clemson's Pee Dee Research and Education Center, which is designed to improve crop yields and quality, increase the per-acre value of crops, and identify superior varieties that enhance agriculture's impact on economic development in the state.

In more than a century of conducting research and sharing it with the people who need the knowledge, the land-grant system – Clemson included – has had its share of ups and downs. In the past decade especially, we've faced, along with South Carolina and the nation, some tough economic times.

In organizing to meet those challenges, Clemson has never lost sight of the vision established by the original Morrill Act statesmen. Now, as we begin filling important positions for the first time in several years, we are as dedicated as ever to the proposition that timely, unbiased research coupled with personal, dirt-under-the-fingernails instruction is the basis for enhanced economic development and improved health and safety in South Carolina's agriculture, forestry and natural resources.

Thank you for allowing us to introduce some of our people and let you know what they are doing for you.



Sincerely,
John Kelly
Vice President for Economic Development

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As invading kudzu bugs spread, scientists and farmers plan their counterattack

By Tom Hallman

The good news is, we can kill them.

The bad news is, it'll cost us.

And the damage they do in the meantime will cost even more.

Kudzu bugs, first discovered northeast of Atlanta three years ago, have swept through Georgia and the Carolinas like Sherman. And like the notorious Yankee, the invading Asian insects wreak havoc wherever they go and remorselessly leave destruction in their wake – especially to soybeans, a staple crop for farmers.

"They've already become an economic pest on soybeans in the areas they've infected. They're fast-moving and can have a significant impact on a crop," said Jeremy Greene, a Clemson University Research/Extension entomologist who is leading the charge to fight back. "Fortunately, we've learned a lot about them in a short time. It's important for us to assess what we know and formulate the best response for the future."

For that reason, Greene hosted a national conference at Clemson's Edisto Research and Education Center in Blackville, S.C. this week, drawing agricultural scientists and farmers alike to plan the counterattack.

While crop pest experts intend an aggressive assault, no one is under the delusion it will be an easy fight.

"The word 'eradication' is not being used with the kudzu bug," said Steve Cole, director of the plant industry department in Clemson's regulatory services division, which oversees efforts to monitor invasive species in South Carolina. "The best we can hope to do is find a suitable method of control."

Mercifully, scientists have come up with insecticides, such as pyrethroids, that kill swarms effectively, minimizing the damage the bugs cause to soybean harvests – which tests show average more than 4 bushels an acre on a crop currently selling for about $17 per bushel.

But the insects reproduce in such large numbers and move about so freely, timing pesticide sprays is a tricky business.

"Our problem isn't killing them. We can do that pretty easily," entomologist Phillip Roberts of the University of Georgia told the group at Edisto. "Our problem is minimizing the number of (insecticide) sprays necessary to reduce the damage to a crop."

So far, scientists are finding that kudzu bugs will produce two generations per year in the United States – one in the spring or early summer, another in the late summer. During the winter, the bugs try to find a nice, warm place to hide away: A hidden corner in human homes is among their favored places, but a barn, outbuilding or underneath the bark of a tree will do in a pinch.

For that reason, good timing is essential for insecticide sprays and crop planting. If your timing is off, you may kill the bugs in one field only to have others swarm in from nearby.

"It's the early infestations we're worried about now," Greene said. "We're studying them to get that application timing down just right."

Widely Dispersed

Since appearing in northeast Georgia in 2009, the Asian bugs now blanket the Southeast from Florida, north to Virginia and west to Alabama, with pockets of infestations recently reported in half a dozen counties in Tennessee and two more in Mississippi. The insect seems to reproduce and spread as efficiently as that other Asian transplant from which they get their name – and on which they feed – kudzu.

"It will probably spread and survive anywhere kudzu survives," Joe Eger of Dow Agrosciences told the conference. He then pointed to a map showing kudzu's range – from Texas and Nebraska to New York and Massacussetts. "Elsewhere in the world it's found almost anywhere kudzu is found, so I suspect it will go much farther north."

This is what draws special interest from the U.S. Department of Agriculture. If the kudzu bug is capable of fol-

*See **Kudzu** page 6*

Clemson marks *100 years* in the Pee Dee

By Peter Hull

As hundreds took part in South Carolina's 2012 Rural Heritage Celebration, Clemson marked a century of service in the Pee Dee.

Bruce Fortnum, director of Clemson's Pee Dee Research and Education Center, said the center's role today is as important today as it was 100 years ago.

While crops and research have changed, the Pee Dee center's primary function remains economic development, Fortnum said. And for that purpose, the land-grant university system – combining research and education to speed innovation to market – is tough to beat, he said.

The center has become the recognized name for certain fields of research, particularly tobacco, cotton and turfgrass, and regularly welcomes visiting scientists from around the world, Fortnum said. More recently, biofuels have become an important research area.

"The center's soils are diverse enough that Clemson scientists can cover just about all the crops of the Pee Dee, and their research benefits the economy of the entire state," Fortnum said.

Center officials marked the centennial by burying a time capsule containing photographs, cameras, agricultural booklets and other items. The capsule will be unearthed in 2061.

The annual outdoor Rural Heritage event featured the best of South Carolina's homegrown foods and exhibits and demonstrations on how the state's rural heritage was shaped. Interactive learning exhibits located along the center's 1.5-mile Outdoor Education Trail described the importance of natural resources found in the ecosystems of the region.

Learn more about the Clemson University Pee Dee Research and Education Center: www.clemson.edu/peedeerec

S.C. livestock veterinarian to work in underserved counties

By Peter Kent

A young veterinarian in Kershaw County is the first in South Carolina to be selected for a USDA program that helps repay his school costs in return for working in a region without enough food-supply veterinarians.

Justin Martin is a 2006 Clemson alumnus and University of Georgia College of Veterinary Medicine graduate. He practices with Ronnie Fulmer at the Camden Veterinary Hospital.

Under the tuition loan-repayment program, Martin will spend a percentage of his time for three years treating food animals in nine Pee Dee counties.

The USDA National Institute of Food and Agriculture created the Veterinary Medicine Loan Repayment Program to address veterinary shortages in rural America by repaying student loans of qualified veterinarians. USDA asked S.C. state Veterinarian Boyd Parr to nominate up to three areas where there is a shortage of veterinarians.

"Dr. Martin's selection is first of all due to his initiative and career goals," said Parr, director Clemson Livestock-Poultry Health, which includes meat inspection and the veterinary diagnostic center. "Justin is an example of a Clemson College of Agriculture, Forestry and Life Sciences graduate coming back to South Carolina to meet a vital need after leaving for veterinary school."

Martin and his wife, Toni, a veterinary technician at the hospital, plan to make their home near Cassatt, a rural community east of Camden. Martin has wanted to be a veterinarian since his teenage years. "I wanted to stay connected to the land and give back to the agriculture community that helped me so much," he said.

Learn more about Clemson Livestock-Poultry Health: www.clemson.edu/lph

Advanced Plant Technology program bridges old and new techniques

By Peter Hull

Shortly after the dawn of human civilization, humankind began to breed plants.

And while techniques improved through the millennia, the basic process was pretty much the same: coaxing desired characteristics from offspring by selecting those traits in the parent plant.

Then, not too many years ago, came molecular genetics. The game changed.

Now Clemson has taken it a step farther: Its new Advanced Plant Technology program will blend traditional plant breeding and molecular genetics into a comprehensive approach to improve crop yields and quality through breeding and field trials.

Along the way, it also will foster development of the Pee Dee region's agricultural economy.

"Collaboration with Clemson plant scientists on the main campus and agronomists at research centers in Blackville and Charleston provides a complete cycle of genetic improvement and agricultural practices for profitable production," George Askew, Clemson associate vice president for Public Service and Agriculture, said in announcing the program at the Pee Dee Research and Education Center Farm Field Day.

The program will increase the per-acre value of crops, identify new crops that can expand the market for South Carolina farm products and provide research-based information to growers on new varieties and production techniques.

The project capitalizes on the Pee Dee region's strong agricultural economy, Clemson's long-standing collaboration with the USDA Agricultural Research Service in Florence and the proximity to the city of Florence and the interstate system, Askew said. It also has potential for collaboration with researchers at Francis Marion and other universities.

The annual field day featured field tours covering cotton, peanut and corn management; tobacco, peanuts and soybeans; and bioenterprise and wildlife. There also were presentations on grain sorghum as an alternative feed grain and flax and opportunities for the Pee Dee region.

Mosquito-borne horse disease falls under watchful eyes

By Peter Kent

The virus bides its time in the bellies of willing mosquitos, concealed in swamps until the opportunity for infection emerges.

When it does strike, eastern equine encephalitis (EEE) can be deadly, especially to horses and other livestock.

In South Carolina, the alarm is raised by Boyd Parr, state veterinarian and director of Clemson University Livestock-Poultry Health. Parr reported six cases of the mosquito-borne illness in 2012 – in Horry, Darlington, Marlboro, Kershaw and Marion counties.

Nine of 10 horses infected with EEE virus die from the disease. In horses, symptoms usually develop from two to five days after exposure. "These diagnoses are a vivid reminder of the threat this and other mosquito-borne diseases are to horses in our state," Parr said. "Protecting horses through vaccination is very important."

Parr urges horse owners to consult with their veterinarian to be sure vaccinations against both EEE and West Nile Virus are up-to-date. West Nile Virus also was reported in a York County horse in 2012.

State law requires that any livestock that display symptoms such as stumbling, circling, head pressing, depression or apprehension must be reported to the state veterinarian's office at 803-788-2260 within 48 hours.

Learn more about Clemson Livestock-Poultry Health: www.clemson.edu/lph

***Kudzu** from page 3*

lowing its namesake into the eastern plains and the upper Midwest, it can press its invasion into the heart of American soybean production.

The bug is bad enough in South Carolina, with 350,000 acres of soybeans that bring in more than $100 million a year, according to the National Agricultural Statistics Service.

But that's a drop in the bucket nationally. The entire U.S. soybean crop was worth $35.7 billion last year, the service reported.

The kudzu bug – so named for its affinity for the ubiquitous creeping vine that has enveloped much of the South – is technically a bean plataspid, which is related to stink bugs. It can secrete a foul-smelling chemical that immediately identifies it. Some people are sensitive to the secretion, making it a medical problem as well as a homeowner nuisance and economic pest.

The bean plataspid feeds on the juices of legumes, pod-bearing plants that include kudzu, soybeans, peanuts, alfalfa and clover, among others. For reasons scientists don't understand – but for which they are grateful – it seems to leave peanuts alone.

Although the bug likes the taste of kudzu, it doesn't require it.

"They don't have to build up on kudzu to move to soybeans. They can overwinter elsewhere and move directly to a bean crop," Roberts said. "That's why we have to get our timing and chemicals right. As long as the kudzu bug's migration is occurring, we can get a re-infestation."

The word "infestation" is often overused when people talk about insects. Not so with the kudzu bug. Without pesticides to protect it, a single soybean plant will harbor dozens of the critters. During the field day in his Edisto meeting, every leaf in Greene's untreated test plots revealed clusters of the bugs.

"These things have tremendous reproductive potential," said David Buntin of the University of Georgia's Griffin research station. "If you're in an area where they have just moved in, you better hold onto your hat."

"They feed on the vascular fluid of the plant, primarily at the stems," said Clemson doctoral student Nick Seiter. "They're not actually feeding on the beans. They like the thick stems and they leave lesions you can easily see. These lesions put a great deal of stress on the plants and can lead to some pretty severe yield losses."

Test plots at Edisto and Griffin averaged an 18 percent yield reduction from the pests. Damage varied widely, though. Some fields were untouched; others lost as much as 50 percent of their yield as the plants set fewer pods with fewer, smaller beans.

The kudzu bug has already caused an international incident – one with ominous portent for American agricultural exports.

"Honduras found seven dead kudzu bugs in a poultry shipment from Georgia. They stopped all agricultural shipments from Georgia, the Carolinas and Alabama for a time," Eger told the conference. "Argentina and Brazil are big soybean producers. They are watching what we do carefully."

In the long term, USDA Agricultural Research Service scientist Walker Jones of Stoneville, Miss., believes that a tiny parasitic wasp, *paratelenomus saccharalis*, may help reduce the explosive population growth of the bug.

Native to Asia like the kudzu bug and kudzu itself, the wasp eats the kudzu bug's eggs from the inside – and not much else.

"Our native stink bug egg parasitoids do not attack the kudzu bug. That's unfortunate," Jones said. "But our research shows that, of all the parasitoids we studied from Asia, *P. saccharalis* is the only one that attacks the eggs of kudzu bugs and nothing else. I've never been so lucky."

Jones expects to petition USDA next year for permission to begin releasing the tiny wasps. He believes they may be effective at reducing the number of kudzu bug eggs by as much as 73 percent, according to studies conducted so far.

In the meantime, farmers face trying to strike a balance between the cost and timing of insecticides and the damage caused by a new, hungry, invasive pest.

"Will yield increases offset the cost of the spray? That's the decision farmers will have to make," said Ron Smith, an entomologist at Auburn University. "With $17 (per bushel) prices, you'll see more sprays than at $7."

"We can control them," Greene said. "It will take discipline. It will take patience. It will take more research to properly define what we're dealing with and how to respond."

Research aims to control vegetable disease

By Jonathan Veit

Growers of pickling cucumbers and other crops susceptible to infection by downy mildew may someday benefit from higher yields and lower production costs thanks to collaborative research by Clemson and North Carolina State University.

"If we can understand the weather factors that lead to a high risk of downy mildew infection, then we can reduce the need for fungicides, reduce the cost of cucurbit crop production and increase yield," said Anthony Keinath, plant pathologist at Clemson's Coastal Research and Education Center in Charleston.

Keinath recently was awarded a USDA grant to develop a model for predicting downy mildew infection risk to cucurbits, a family of plants that includes various squashes, melons and gourds. His research is part of a wider study being conducted by N.C. State for USDA.

Downy mildew also contributes to a decrease in production of pickling cucumbers in South Carolina. Keinath's research has shown a 68 to 90 percent loss of yield due to infection, which would mean $900,000 in potential losses to South Carolina pickle growers. A 2004 epidemic of downy mildew infection cost U.S. growers an estimated $20 million in lost yield.

Keinath and his collaborators hope to quantify the effects of weather variables such as temperature, humidity, rainfall, dew point and cloud cover on the risk of infection.

They also hope to validate the current cucurbit downy mildew forecasting system that is composed of 25 collaborating institutions in the eastern United States, California and Ontario, Canada, that report weather and other factors to a central online database.

Currently, growers of cucurbit crops, such as pickling cucumbers and cantaloupes, must spray costly fungicides to protect their crops from infection. In Michigan, the largest U.S. producer of pickling cucumbers, fungicide sprays cost farmers $6 million annually.

Learn more about activities at the Coastal Research and Educational Center: www.clemson.edu/coastalrec

Clemson plant breeders roll out new oat variety

By Peter Kent

Graham – a new high-yielding variety of oats named for a long-time plant breeder at Clemson – has joined the family of products available to South Carolina farmers.

"Graham has excellent seed yield potential, exceeding the Rodgers variety by 20 bushels per acre at some locations," said Chris Ray, director of the S.C. Crop Improvement Association, which grows certified seed for sale to the public.

The new variety grows to medium height, withstands falling over (lodging), matures earlier and produces more seed than comparable varieties. It is named for W. Doyce Graham, a small-grains breeder at Clemson University from 1966 to 2003.

The seed is produced at Clemson University Experiment Station research centers and made available to producers and seedsmen. From fertilizer to fuel, prices are higher these days. Seed can account for as much as 10 percent of a farmer's input costs, so seed quality is a major factor in grower success.

"Our mission is to cooperate with Clemson University, USDA and other agricultural agencies in developing, testing, producing and distributing superior strains and varieties of planting stock," Ray said.

"Better seed means quicker emergence, better stand establishment and vigorous growth to suppress weed infestations," he said. "What's more, uniform plant development – flowering and maturity – makes it easier to time fungicide or insecticide applications. And it means easier harvest and reduced drying costs."

For more about the S.C. Crop Improvement Association: www.clemson.edu/seed

Show Me!

Field days are the 'how-to' of agriculture instruction

By Peter Hull

You probably learned the story – or some version of it – in elementary school.

How the Pilgrims suffered through their first harsh winter in the new Plymouth Colony – cold, hungry, ill-educated and unprepared for life in the New World.

Then came Tisquantum, a member of the Patuxet tribe, popularly known as Squanto. He showed the newcomers how to plant corn. How to fertilize it with the carcasses of native fish. How to catch those fish.

How to.

You might call Squanto the first county agent. And his method of instruction, a tribute to the nickname of Missouri, formed the foundation of American agricultural education from that day forward.

Field days – those hands-on instructional demonstrations that are ubiquitous in agriculture – have been an integral part of the land-grant university system since the Morrill Act was established more than 150 years ago.

While the science has become somewhat more sophisticated since Squanto side-dressed that Massachusetts maize with decaying menhaden, the principle is still the same: Take the necessary knowledge to the people who need it. Show them what they need to know.

Clemson Extension specialists and county agents do this week-in and week-out in every corner of South Carolina, showing farmers and agribusinesses how to make the most of the latest research-driven knowledge. Here's a short sampling of field days from around the state.

For more information on field days and research at these Clemson Research and Education Centers:
www.clemson.edu/peedeerec
www.clemson.edu/edisto
www.clemson.edu/coastalrec
www.clemson.edu/public/psatv/ag

Precision is the watchword at Peanut and Corn Field Day

By Peter Hull

When you wash a dog, you do your best to keep the soapy water on the dog – and not on everything else.

The same is true in applying irrigation or chemicals on the farm: You want to put them just where you need them, when you need them there.

It's called "precision agriculture," and it's important not only for producing higher yields, but controlling costs and protecting the environment.

It was also a central topic at the Peanut and Corn Field Day at Clemson's Edisto Research and Education Center this fall, when experts presented the latest techniques and findings from recent variety trials.

The field day included overviews of crop variety comparisons, planting techniques, insect management, soil-borne disease research and new technologies.

Clemson precision agriculture specialist Will Henderson led farmers through a demonstration project that uses a twin-row planter for peanuts. The planter, which typically is used for corn, carries a hopper that can hold about 1,000 pounds of seed. The seed was planted across a field moving at three speeds: 2 mph, 4 mph and 6 mph.

The demonstration project will help determine if planting peanuts at such rates improves or adversely affects yield.

"Planting peanuts is a long, slow process," Henderson said. "Any improvements in efficiency can save a grower precious time and money."

Vegetable Field Day delivers nutrition, sound farming practices

By Peter Hull

Shhhh! Don't tell the kids: Watermelons aren't just sweet and juicy. They're also good for you!

A staple summer crop in South Carolina, watermelons are an important source of vitamins and minerals – essential ingredients for a healthy lifestyle, scientists told more than 200 people at the Watermelon and Vegetable Producers Field Day at Clemson's Edisto Research and Education Center.

"I argue the value is in the complete fruit," Penny Perkins-Veazie, a post-harvest physiologist with the horticultural science department at N.C. State University, told the group.

She rattled off a litany of watermelons' benefits, including potassium, a very important electrolyte salt; vitamin C, to help maintain a healthy immune system; and vitamin A, a major factor in preventing blindness, among other benefits.

On the other side of the equation, farmers received the latest information on improved production techniques, viewing field trials and presentations on grafting in watermelon, sensor irrigation, fertilizers, squash bugs and spider mites – in between sampling more than 90 melon varieties.

Tony Keinath, a vegetable pathologist at Clemson's Coastal Research and Education Center in Charleston, warned of four key diseases that can reduce crop yield: powdery mildew, gummy stem blight, downy mildew and anthracnose.

At Cotton and Soybean Field Day, water and bugs present challenges

By Peter Hull

To any farmer, water means money, and using the right amount of water can bring significant rewards.

José Payero, an irrigation specialist at Clemson's Edisto Research and Education Center, told farmers at the center's Cotton and Soybean Field Day that irrigation is a matter of how much and when.

Correct irrigation of a field can increase yield by as much as 65 percent – and maximize profits, he said.

It's not as simple as it sounds. In-ground moisture sensors can provide farmers valuable data and help take the guesswork out of when and where to irrigate. The question becomes: How much is a farmer willing to spend to gain that data?

Modern technology allows farmers to receive data immediately from the field wirelessly via cell phones or even satellite. Such precision can generate significant long-term savings, but technology comes with up-front costs.

"Continuous data require investment, but can bring long-term savings in water and fertilizer," Payero said. "It all depends how much the farmer wants to invest."

Other field day presentations covered new crop varieties and management of weeds, diseases and insects.

"The kudzu bug is a new pest, but it looks like it's here to stay," said Clemson entomologist Jeremy Greene. "We've got to find a way to deal with it, because it can be a devastating insect."

Careful management means more "green" for turfgrass industry

By Jonathan Veit

The green, green grass of home begins with effective, research-based turf management protocols.

That was the message shared with hundreds of eager ears of turfgrass industry leaders and golf course superintendents from across South Carolina at Clemson's Turfgrass Research and Education Field Day.

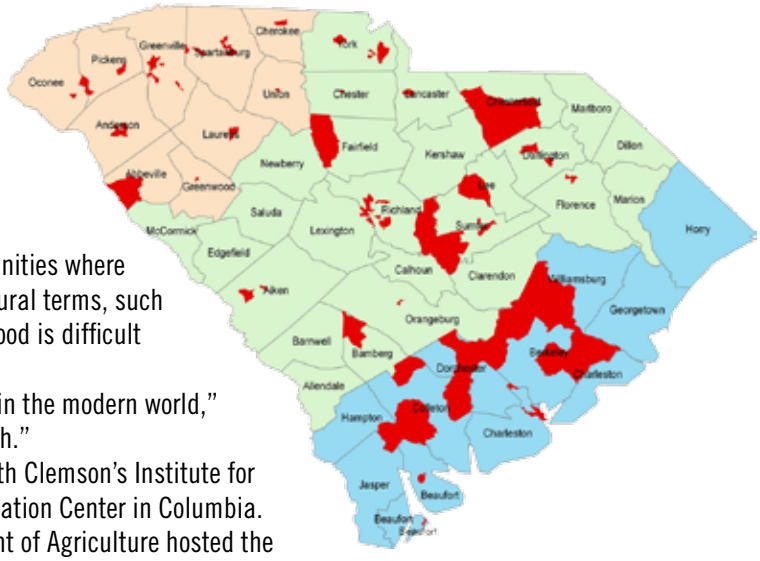
Clemson experts presented research findings on managing bentgrass golf greens with organic products, using plant growth regulators to reduce mowing, postemergent weed control, and the effectiveness of using liquid products for thatch control.

During the field day, John Brown, president of NewLife Turf Inc., a grower of golf-course quality turfgrass in Norway, S.C., presented a check to Clemson's turfgrass program.

"The Clemson Turfgrass Program has helped me a lot over the years. I think this is one of the best turfgrass teams in the country," Brown said. "The donation is my small way of supporting the research they're doing here at Clemson."

Clemson's turfgrass program is conducted by an interdisciplinary group of scientists with expertise in horticulture, entomology, soils and plant sciences.

'Food deserts' workshop highlights a growing concern across state



By Peter Hull

Hundreds of thousands of people across South Carolina live in communities where access to supermarkets or large grocery stores is beyond reach. In agricultural terms, such areas are called "food deserts" – communities where healthy, affordable food is difficult to obtain.

"For a growing population, healthy foods are much harder to come by in the modern world," said Clemson professor Dave Lamie. "For many, they sadly are beyond reach."

Lamie is chairman of the S.C. Food Policy Council and a researcher with Clemson's Institute for Economic and Community Development at the Sandhill Research and Education Center in Columbia.

The Food Policy Council, Lowcountry Housing Trust and S.C. Department of Agriculture hosted the "Growing Food and Opportunities in South Carolina: Economic and Community Development through Healthy Food Access," a workshop to address the health and socio-economic issues associated with food deserts.

Municipal, charity, retail and education officials met at the S.C. State Farmers Market to discuss ways to decrease food deserts across South Carolina and how healthy environments can drive economic development.

The U.S. Department of Agriculture broadly defines urban food deserts as low-income census tracts where people live more than a mile from a supermarket or large grocery store. In rural areas, that distance expands to people living more than 10 miles from supermarkets or large grocery stores.

In South Carolina, 1,632 rural and 4,897 urban communities meet the food-desert definition, said Michelle Mapp, executive director of Lowcounty Housing Trust.

Poverty exacerbates the problem, and no one group can fix the problem. Governments, philanthropic groups and free enterprise cannot fix problems associated with food deserts unless they work together, said keynote speaker Jeff Brown, chief executive of Brown's Super Stores, a Philadelphia-area grocery store chain and an active member of the city's nonprofit organizations that aim to improve access to food in low-income communities.

To view USDA's interactive national food deserts map, visit: www.ers.usda.gov/data-products/food-desert-locator

Extension agent discovers invasive pest in South Carolina

By Tom Hallman

A tiny hitchhiker newly discovered in South Carolina could mean trouble for homeowners who relish the sweet smell of eucalyptus trees.

"A homeowner brought it into the Lexington Extension office from West Columbia. I knew it was a tortoise beetle, it was just a matter of finding out what kind it was," said Vicky Bertagnolli, a Clemson Extension Extension agent in Lexington County. "Eucalyptus typically doesn't have that many pests, so it was pretty easy to find."

Once she had identified the invasive pest as a eucalyptus leaf beetle, Bertagnolli sent photos to the U.S. Department of Agriculture and entomologists at Texas A&M and Auburn University for independent confirmation.

Separate samples of the bugs then arrived at the Plant Problem Clinic, a part of Clemson's Regulatory Services unit, from a retail nursery in Richland County and a homeowner in Chester.

The bugs likely hitched a ride on a shipment of eucalyptus from the other side of the continent, Bertagnolli said. They can cause extensive damage to eucalyptus leaves, potentially endangering the plant.

"They have a big problem with the beetles on commercial eucalyptus in California," Bertagnolli said. "In South Carolina we don't have commercial eucalyptus production, but it certainly could be a problem in landscapes."

A popular tree in home and business landscapes, the eucalyptus is prized both for its look and its aroma. It thrives in warm climates and many varieties sport an eye-catching, silvery leaf.

The eucalyptus beetle is a regulated pest in California, but not nationally, said Sherry Aultman, who coordinates Clemson's Cooperative Agricultural Pest Survey (CAPS) program. Until now, it had never ventured into South Carolina.

"They found the first species of eucalyptus beetle in Riverside County in 1998. It's in most of the counties in California now," Bertagnolli said. "A second species was discovered in Orange County in 2003, and by 2009 had found its way into four nearby counties. That's the species we found here. It had remained relatively contained until it hitched a ride east."

Learn more about the eucalyptus leaf beetle:
www.clemson.edu/regulatory/plant_industry/invasive_exotic_programs

Bringing firewood to campsites threatens forests

By Tom Hallman

The weekend finally arrives. You escape to the woods, pitch a tent, roast your marshmallows – and destroy South Carolina's beautiful ash trees.

OK, so you didn't mean to destroy the ash trees. But that's what can happen when you bring your own firewood into your favorite campsite.

“Bringing firewood into state parks and campsites from other places is a leading cause of importing invasive species into our forests,” said Sherry Aultman of Clemson’s department of plant industry. “It seems like such a simple, innocent thing, but it can be deadly to our native trees.”

Firewood can harbor any number of nasty bugs, both under the bark and inside the wood itself.

Among the most sinister is the emerald ash borer, a green beetle native to Asia.

As coordinator Clemson’s Cooperative Agricultural Pest Survey, one of Aultman’s jobs is to keep an eye out for the ash borer and other damaging pests.

Clemson’s Regulatory Services division is charged with monitoring and, when possible, eradicating invasive plant and pest species in South Carolina. The unit has set up traps in forests throughout the state to provide an early warning of the ash borer’s arrival.

The distinctive two-foot-long purple traps, which hang from tree limbs by a metal hook, include a natural plant oil scent to attract the beetles and are covered with a glue that will capture them. Purple was chosen because it's the color most likely to attract the bugs.

“It’s not a matter of if, but when the ash borer gets here,” Aultman said. “We’re trying to be as alert as possible to slow their spread.

“South Carolina is fortunate to have several different species of ash trees,” she said. “They’re a beautiful tree and also a very useful one. We want to protect them as best we’re able.”

Learn more about the Clemson’s Cooperative Agricultural Pest Survey:
www.clemson.edu/regulatory/plant_industry/invasive_exotic_programs
www.clemson.edu/public/psatv/ag

Gardening goes digital with new mobile apps

By Tom Hallman

Finally, gardeners can have it both ways: Even in the serenity of the great outdoors, all the resources of modern science are available at their fingertips.

New mobile phone applications created by scientists at Clemson and half a dozen other land-grant schools puts an entire science library – equipped with alerts to warn of major disease and insect pests – right in the gardener's pocket.

"It's sort of like having an expert with you on the job every day," said Sarah A. White, an assistant professor in the Clemson Institute of Environmental Toxicology and, with colleague J.C. Chong at the Pee Dee Research and Education Center, one of the developers of the tool. "The app will send you a text to alert you about pests as they emerge and even remind you about time-sensitive gardening tasks."

The mobile apps cover the gamut, from basic horticultural practices to control of diseases, insect and weeds. They include alerts to current disease and insect threats, information on how to combat them as well as major horticultural practices and recommendations.

The scientists developed two versions of the mobile phone software: a sleek version for the home gardener, called IPMLite, and a super-charged version called IPMPro for "green industry" professionals.

The developers recommend IPMLite for home gardeners and landscaping enthusiasts, Master Gardeners and garden club members.

The apps take their "IPM" name from the practice of "Integrated Pest Management," a technique developed to help farmers manage crop pests by using environmentally friendly methods that take into account biological control – such as the life cycles of plants and pests – as well as chemical controls, like pesticides.

"It's a good-sense approach to pest control," White said. "The IPMLite and IPMPro apps were developed with the most successful, proven methods recommended by leading horticulture and pest management professionals in land-grant universities across the South. Gardeners tend to be a pretty self-sufficient bunch, but no single one of us could have had all this knowledge at our disposal in the field until now."

Find out more:
www.ipmproapp.com and ipmliteapp.com

Forage-fed bulls pass the test at Edisto research sale

It's a test many students would jump at the chance to take: All you have to do is eat. Grades are based on how much weight you gain.

The trick is, all you get to eat is grass. And you have to be a bull.

For more than 30 years, young bulls have been taking this annual test at Clemson University's Edisto Research and Education Center.

Beef and forage specialists with the Clemson Extension Service carefully evaluate the animals to see how efficiently they gain weight on a diet of pasture grass.

"This is the diet that the bulls' offspring will have. Bulls with a proven ability to gain weight on grass are more likely to pass that trait onto the next generation," said Kevin Campbell, coordinator for this year's test and a Clemson Extension agent for livestock and forages.

"These bulls will be providing the genetics for the next generation of calves that will go into the cattle industry in South Carolina and throughout the Southeast," Campbell said. "They are proven genetics. That's what the test is all about."

The 2012 class – 28 bulls from five cattle breeds – spent 168 days on their lessons this year. They were monitored throughout the test and graded on three scales: average daily weight gain during the test, weight per day of age at the end of the test and on an index that takes both those measures into account.

The final exam came in October, when Clemson and the S.C. Cattlemen's Association hosted the 2012 Edisto Forage Bull Test Sale. The auction to local cattle breeders drew more than $80,000 for the animals.

"It's really a good chance for the local producers to get a high-quality bull. You know what you're getting when they've been through a test like this," said John Mueller, director of the Edisto center. "The test is designed to closely resemble what cow-calf producers do here, which has made it very popular."

Top-performing bulls in the test gained as much as three pounds a day. By the auction date, the bulls were averaged 20 months old and weighed about 1,350 pounds. Most were Angus, the predominant breed for Carolina cattle producers, but the test also included Red Angus, Polled Hereford, Brahman and Gelbvieh.

"This is a good opportunity for us to compare our genetics to other breeders in the state and to make changes as we come home to our breeding program to allow us to benefit the commercial cattle producer," said Frankie Mullikin of Mull Meadows Farm in Liberty, who has participated in the bull test for 20 years. "Cattle prices are up now, but our inputs – fuel, grain costs, fertilizer – all

those are up also. So it's important for us to balance that out, and the way we can do that is through more grass feeding."

"The bull test provides a level playing field. Buyers know precisely what they're getting," Campbell said. "By utilizing forages and taking the feed out of the equation we have cut the cost to the consignors almost in half. These bulls will be adding a lot to the industry in South Carolina because they will go back into commercial cattle herds."

Learn more about the Edisto Forage Bull Test: www.clemson.edu/extension/beef
See videos and interviews with participants: www.clemson.edu/public/psatv/ag

Experts look to offset corn costs for cattlemen

By Peter Kent

When you want to get to the bottom of something, you go straight to the horse's mouth.

So it makes sense that in the cattle business, you go straight to the cow's mouth.

That's precisely how John Andrae, forage and pasture expert for Clemson Extension, believes cattle producers can save money in cost-conscious times – and ultimately protect consumers from higher prices for beef.

In a pair of studies in the past five years, Andrae and his colleagues have shown that certain diets of grasses – instead of expensive feedlot corn – can enable cattle to reach market weight, called "finishing."

"High corn prices certainly drive up feedlot costs and may decrease prices for animals headed to the Midwest for finishing," said Andrae, a member of Clemson's Center for Nutritional Physiology and Metabolism, which seeks to improve livestock genetics, health, nutrition and dinner-plate appeal.

As drought in the nation's corn belt caused corn prices to skyrocket in 2012, the researchers, including director Susan Duckett, Tom Jenkins, Scott Pratt and Andrae, took this message to cattle producers in a workshop at the Simpson Station, Clemson's beef research farm in Pendleton.

One of their studies focused on five forage species – bermudagrass, pearl millet, chicory, alfalfa and cowpea – for finishing beef cattle in the summer.

"This study presents alternatives for growing and finishing cattle in hot months," Duckett said. "These forages can be used as options to grow cattle to heavier weights for finishing on grass/forage alone or cattle could be placed in a feedlot and finished for a shorter period of time on corn grain after grazing on these forages."

The second study is ongoing, comparing grasses and legumes, such as soybeans and alfalfa, Duckett said. "We are in the middle of a study examining grazing an all-grass forage chain and comparing it to an all-legume forage chain," she said. "Within each chain half of the animals are receiving a moderate amount of corn to improve weight gain and reduce the stress on pastures."

The South Carolina cattle industry in 2010 had a total of 385,000 cattle and calves and 16,000 milk cows, with a market value of approximately $157 million, according to the USDA National Agricultural Statistics Service.

Center for Nutritional Physiology and Metabolism: www.clemson.edu/cafls/departments/animal_vet_science/cnpm.html

Marine biologist seeks genetic pearls in oyster DNA

By Peter Kent

The shell of an oyster is a drab, mundane thing. But lurking underneath that dull exterior is a complex DNA that enables the creature to adapt to stressful living conditions.

Research by Clemson marine biologist Andrew Mount shows that the oyster's genes enable it to adapt and cope with environmental stresses, such as temperature and saltwater changes, air exposure and heavy metal pollution, and that shell formation is a far more complex process than previously thought.

"The genome sequencing and the research to understand how genes work represent a first and highly significant step in marine genomics," Mount said. "It identified the genetic mechanisms that give oysters the ability to respond to environmental stress and produce their protective shell."

Mount was part of a team of marine biologists, led by Goufan Zhang of the Institute of Oceanology at the Chinese Academy of Sciences, that identified and catalogued the genes of the Pacific oyster – the first mollusk to have its genome decoded, sequenced and analyzed. Findings from that research recently were published in the journal Nature.

The research will have an impact on studies of the eastern oyster, as well, which is the focus of Mount's study at Clemson.

Mount founded and leads the Okeanos Research Laboratory at Clemson, where studies about how shells form, grow and are nourished have led to new technologies. His work on shell formation has led him to see the mollusk's cell as a way of gauging the threat of ocean acidification.

"The oceanographic geochemistry community has become alarmed over the past several years over increasing levels of ocean acidification," caused when the sea absorbs carbon dioxide from the atmosphere, he said. "Now that we have a better understanding of how these organisms actually calcify at an intracellular level, science is better equipped to investigate the threat that ocean acidification poses to the future of the world's food security."

Oysters offer potential biotechnological pearls. The ability of oyster cells to produce one of the toughest bioceramic materials known, coupled with the knowledge of the genes involved, presents a portal for innovation in materials science.

"Biologically produced, cellular materials have a hierarchy of order that is unmatched by mankind," said Mount. "The production of useful and novel materials by harnessing the genome of mineralizing cells opens a bold new frontier for technological development."

Learn more about the Okeanos Research Laboratory: www.clemson.edu/okeanos/

Hundreds of sensors to provide Savannah River ecology data

By Peter Kent

Hundreds of sensors along the 312-mile Savannah River will collect and transmit real-time data about the quality and quantity of water to scientists in a wide-ranging study of the river's ecology.

It's a step in the Intelligent River project, in which Clemson University researchers are teaming up with Coastal Carolina University colleagues to deploy and monitor the sensing devices.

The Intelligent River environmental data-collection system or "macroscope" will include a network of remote sensors to collect, store and send data on river conditions ranging from water quality and flow to stormwater runoff and pollution discharges.

Wireless transmitters will send data on temperature, water clarity, dissolved oxygen and other environmental indicators to Clemson, where the information will be processed and posted on the Internet. Anyone anywhere in the world can monitor the well-being of the river.

The Burroughs and Chapin Center for Marine and Wetland Studies at Coastal Carolina will provide watercraft and technical staff to deploy the equipment, replace field equipment as necessary and assist in routine maintenance.

"CCU's Center for Marine and Wetland Studies has extensive experience in deploying and operating a wide range of scientific instrumentation in diverse environments," said Gene Eidson, director of Clemson's Institute of Applied Ecology. "We are excited to have them as a partner."

Clemson and Coastal Carolina have partnered on offshore renewable-energy initiatives for several years, combining the strengths of Clemson's Restoration Institute, engineering and energy programs and Coastal's marine science and ocean atmospheric observation and modeling capabilities.

"Joining Clemson's Intelligent River team will be a great extension of the existing offshore cooperative efforts bringing technical resources and capabilities together that are needed to better understand and manage our environmental resources as integrated systems," said Paul Gayes, director of the Burroughs and Chapin Center.

Learn more about the Intelligent River project: www.clemson.edu/public/psatv/env

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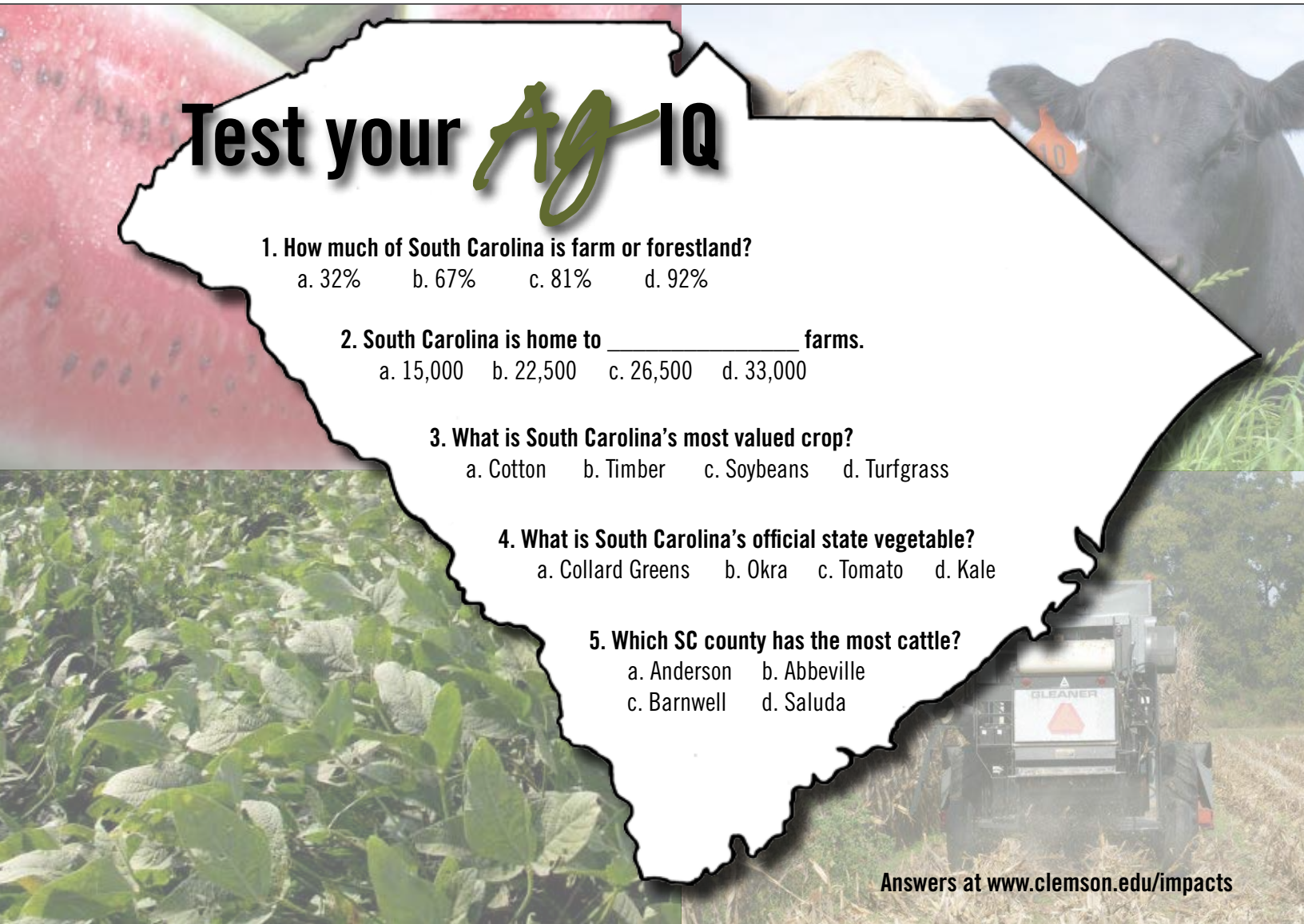

Test your Ag IQ

1. How much of South Carolina is farm or forestland?
a. 32% b. 67% c. 81% d. 92%

2. South Carolina is home to _____ farms.
a. 15,000 b. 22,500 c. 26,500 d. 33,000

3. What is South Carolina's most valued crop?
a. Cotton b. Timber c. Soybeans d. Turfgrass

4. What is South Carolina's official state vegetable?
a. Collard Greens b. Okra c. Tomato d. Kale

5. Which SC county has the most cattle?
a. Anderson b. Abbeville
c. Barnwell d. Saluda

Answers at www.clemson.edu/impacts